

Max. Marks: 60

## K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22 (Autonomous College Affiliated to University of Mumbai)

Subject Code: HAIMLC501 /HDSC501

Subject Name: Mathematics for AI & ML/Mathematics for Data Science

Nov - Dec 2022 Program: B. Tech

Examination: TY Semester: V

Course Code: HAIMLC501 /HDSC501 and

Course Name: Mathematics for AI & ML/Mathematics for Data Science

Duration: 2.5 Hours

Instructions:

(1) All questions are compulsory.

(2) Draw neat diagrams wherever applicable.

		Max. Marks	СО	BT level
Q 1	Solve any six questions out of eight:	12	50.24d)	93. 15
i)	If $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ , find the eigen values of A and eigen vectors for $\lambda = 5$ only.	2	1	3
ii)	State central limit theorem.	2	2	3
iii)	State the type of variables in each of the following exercises. Are they discrete or continuous?  a) Weight of newspapers recycled on a single day b) Number of claims filed with an insurance company during a single day c) Time required to complete a questionnaire d) Number of consumers in a poll of 1,000 who consider nutritional labeling on food products to be important	2	3	3
iv)	State four benefits of feature engineering.	2	4	3
v)	Find the optimum value of $x$ for the function $f(x) = 12x - 3x^4 - 2x^6$ with initial value $x_i = 1$ for first iteration only using Newton's Method.		5	ball 1
vi)	Which are the reasons for poor data quality?		4	3
vii)	Parking on Campus Six vehicles selected from a campus vehicle database are shown in the table.	2	3	3

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	Vehicle	Туре	Make	Carpool?	One-way Commute Distance (kilometers)	Age of Vehicle (years)	g Xonst Tandis		N 30	20 20 20
	1	Car	Honda	No	37.8	6			pH.	100
	2	Car	Toyota	No	27.5	3				MAL
	3	Truck	Toyota	No	16.2	4			E HILLE	SHU H
	5	Van Motor- cycle	Dodge Harley- Davidsor	Yes No	50.7 40.8	2		enter de la composition della	Sile iss collect	O F.E.
	6	Car	Chevrolet		8.6	9				
					asured. What ivariate data?		they?	TOUG W	L MITTER OF	7 (C) (Se)
viii)	What is I	Dimensio	onality Re	duction?				2	6	3
Q.2	Solve any four questions out of six.				16		N. L.			
)	Apply Gauss Elimination Method to solve $x + 3y - 2z = 5$ , $2x + y - 3z = 1$ , $3x + 2y - z = 6$ .					4	1	3		
	The means of two independent samples of size 8 and 7 are 1134 and 1024 respectively. The standard deviation of these two samples is 35 and 40 respectively. What is the value of test statistic <i>t</i> in order to test the significance of difference between sample means?					The second second second second second	-			
ii)	1024 resp 35 and 40	ectively respect	The stantively. Wh	dard devia at is the va	tion of these lue of test sta	two samp	les is	4	2	3
	1024 resp 35 and 40 test the si The Dow trading for following Dow Jon	Jones In or 10 day table.	v. The stantively. Whatee of different Austrial Aver	dard devia at is the va erence betw everage wa ent year wi	tion of these lue of test sta ween sample as monitored th the results	two samp atistic <i>t</i> in means?  at the clos shown in	les is order to se of	4	3	3
	1024 resp 35 and 40 test the si The Dow trading for following	Jones In table.  graph of the state of the s	v. The stantively. Who ice of different areas in a recent strial Aver	dard devia at is the va erence between average wa ent year wi	tion of these lue of test sta ween sample	two samp atistic <i>t</i> in means?  at the clos shown in	les is order to se of	n io tda o to o t		(9:3). M
ii)	1024 resp 35 and 40 test the si The Dow trading for following Dow Jon	Jones Industrial Jones	7. The stan cively. Whose of different areas in a recent strial Aver 3 a 21,320 21	dard devia at is the va erence between average wa ent year wi	tion of these lue of test staveen sample is monitored the results	two samp atistic <i>t</i> in means?  at the clos shown in	les is order to se of	n io tda o to o t		(9.3) (4
	The Dow trading for following Dow Jon Day 1 Draw the	Jones In Jon	7. The stantively. What is a constrial Average of the strial Avera	dard devia at is the value are the value are developed was average was ent year with age $\frac{4}{5}$ , $\frac{5}{414}$ , $\frac{21}{409}$ of $f(x) =$	tion of these lue of test staveen sample is monitored the results	two samp atistic $t$ in means?  at the closs shown in  8 9 21,638 21,638	les is order to se of	n io tda o to o t		(9.3) (4
v)	The Dow trading for following Dow Jon Day The Dow the Find the of the interv	Jones In Jon	r. The stan cively. Whose of different areas of the strial Average at 1,320 21 art.	dard devia at is the value are the value are between the value are with a second and the value are	tion of these lue of test staveen sample is monitored that the results $ \frac{6}{21,532} $ $ \frac{7}{21,532} $ $ \frac{21,553}{21,553} $	two samp extistic $t$ in means? at the closs shown in $\frac{8}{21,638}$ $\frac{9}{21,638}$ $\frac{21,63}{21,63}$ $\frac{4}{21,60}$ $\frac{60x^2}{21,60}$ ethod.	les is order to se of	4	3	3
ii)	The Dow trading for following Dow Jon Day 1 DJIA 21,4 Draw the Find the or the interv	Jones In Jon	r. The stan cively. Whose of different areas of the strial Average at 1,320 21 art.	dard devia at is the value at its answer	tion of these lue of test staveen sample as monitored the the results $\frac{6}{21,532} = \frac{7}{21,533}$ $x^4 - 14x^3 - \frac{1}{2}$ The specific of the sample of	two samp extistic $t$ in means? at the closs shown in $\frac{8}{21,638}$ $\frac{9}{21,638}$ $\frac{21,63}{21,63}$ $\frac{4}{21,60}$ $\frac{60x^2}{21,60}$ ethod.	les is order to se of	4	3	3

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i)	Find a root of an equation $f(x) = x^3 - x - 1$ using Regula Falsi method.	8	5	3
ii)	A certain drug administered to 12 patients resulted in the following change in them  Blood Pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4  Can we conclude that drug increase the Blood Pressure?	8	2	3
iii)	The qualitative variable "class status" has been recorded for each of 105 students in an introductory statistics class, and the frequencies are shown in following table  Status Freshman Sophomore Junior Senior Grad Student Frequency 5 23 32 35 10  Draw Pie and Bar Charts for status.	8	3	3
Q.4	Solve any two questions out of three.	16		
i)	Find the dimension and basis for the four fundamental subspaces for $A = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{bmatrix}_{3\times4}$	8	1	3
ii)	Explain the processes involved in feature engineering.	8	4	3
iii)	Explain how the Linear Discriminant Analysis (LDA) work?	8	6	3

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